CHEROKEE NATION

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Deputy Principal Chief

April 3, 2007

Aunjanee Gautreaux, 6PD-Q
Air Quality Analysis Section
U. S. EPA, Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

RE: CHEROKEE NATION COMMUNITY AIR TOXICS PROJECT THIRD QUARTER TECHNICAL REPORT

Dear Ms. Gautreaux:
Enclosed is the Third Quarter Technical Report (December, 2006-February, 2007) for the Cherokee Nation's Community Air Toxics Project (Cooperative Agreement number XA-96619701-0). The third quarter financial report and MBE/WBE will be provided by the Cherokee Nation Accounting Department and by our budget analyst, respectively.

If you have any questions regarding these matters, please call Ryan Callison at 918-453-5093 or Kent Curtis at 918-453-5095.

Sincerely,

Jeannine Hale

Jeannine Hale
Administrator for Environmental Programs

Enclosure

cc: File

QUARTERLY TECHNICAL REPORT
for
CHEROKEE NATION ENVIRONMENTAL PROGRAMS (CNEP)
COMMUNITY AIR TOXICS PROJECT
(XA-96619701-0)

THIRD QUARTER FY2006
(DECEMBER, 2006 – JANUARY & FEBRUARY, 2007)

OVERVIEW OF PROJECT ORIGIN AND PURPOSE

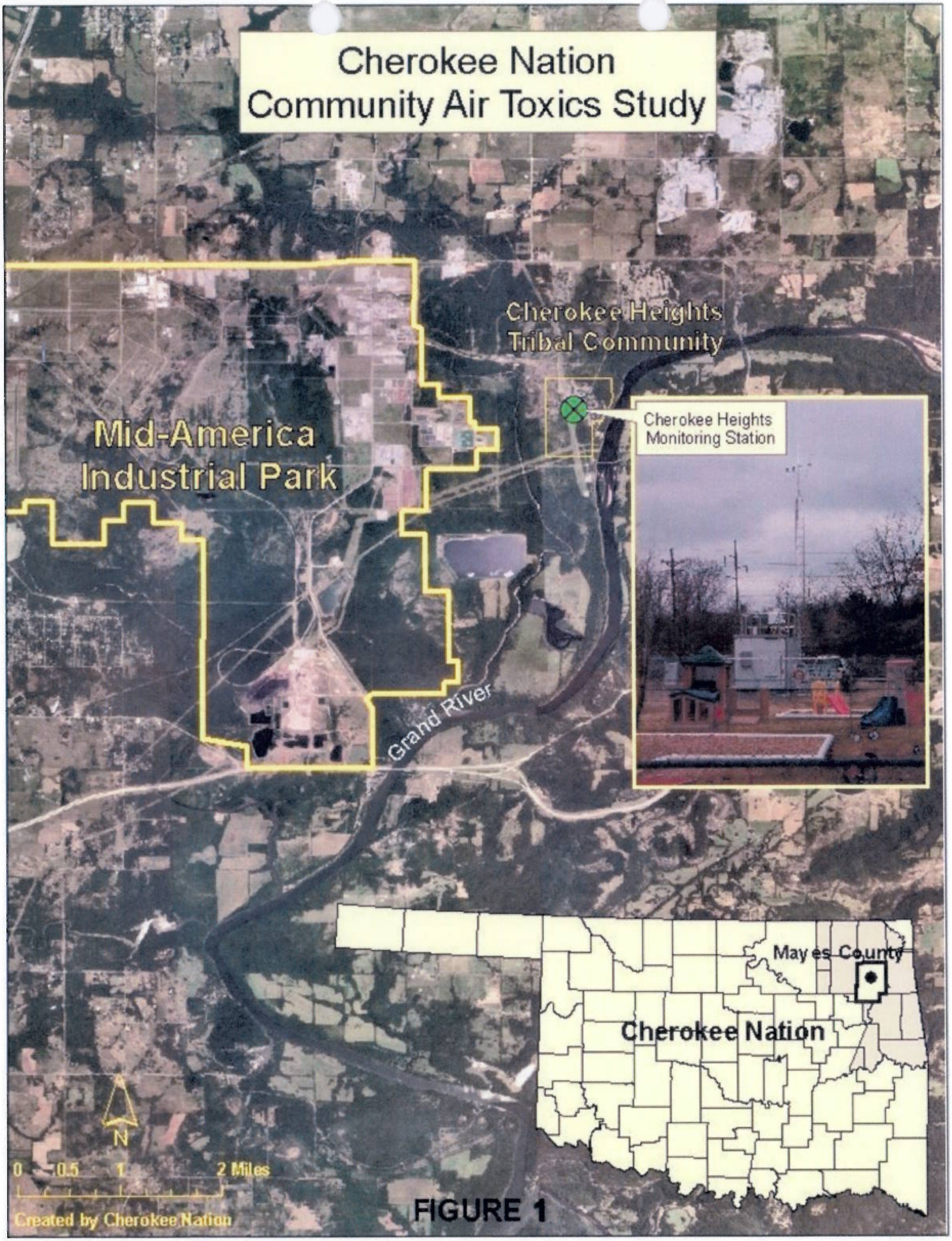
The origin and purpose of this project are described in the first quarterly technical report for this project. In summary, the Cherokee Nation is currently conducting this 18-month VOC sampling project at its Cherokee Heights (aka, Pryor) site (**Figure 1**), collecting samples in vacuum canisters for analyses via EPA Test Method TO-15. Over 90 samples will be collected using a 1-in-6 day sampling interval. The 18-month project will document seasonal variations in VOC concentrations and will focus on hazardous air pollutants (VOC HAPs) identified as "drivers" in the 1999 NATA, as well as on VOC HAPs detected in the Cherokee Nation's screening project from the winter of 2005. Project data will be shared with the EPA, the state of Oklahoma (ODEQ), the Cherokee Nation, and the general public via AQS, XML flat file, and other means, as appropriate.

THIRD QUARTER GOALS, OBJECTIVES, AND ACCOMPLISHMENTS

1. Continue sample collection in accordance with the Proposed Sampling Schedule for this project. Sample collection began as scheduled on September 26, 2006. Twenty-seven samples (plus three duplicates) were collected as of March 13, 2007. Summary information for these 30 samples is shown on the first two pages of the Proposed Sampling Schedule for this project, which is included as **Appendix A** of this quarterly technical report. Two samples – collected on December 1st and December 25th – were invalid (unuseable) because the sample canisters had internal pressures of zero at the end of sample collection. A further explanation of problems encountered with sample collection and analysis is included in the "Problems Encountered" section of this quarterly technical report.

2. Perform NATTS Certification and flow verification check on backup RM910A sampler. The CNEP sent its backup sampler to ERG for an EPA Compendium Method TO-15 "canister sampling system certification" (aka, NATTS Certification) in February, 2007. ERG performed this certification on February 5 and the sampler passed the certification. ERG returned the sampler to the CNEP in February, but the CNEP has not yet performed a flow verification check on it.

3. ERG will begin reporting sample data to the CNEP within 45 days after the completion of the first month of sample collection. The CNEP received lab data for its first seven samples – collected from September 26th through October 26th – from ERG in


Cherokee Nation
Community Air Toxics Study
Cherokee Heights
Tribal Community
Cherokee Heights
Monitoring Station
Mid-America
Industrial Park
Grand River
Mayes County
Cherokee Nation
N
0 0.5 1 2 Miles
Created by Cherokee Nation
FIGURE 1

December, 2006. Subsequently, the CNEP received data for samples collected in November and December, 2006 and in January, 2007. The CNEP has analyzed this data. The CNEP's Data Summary reports are included in **Appendix B** of this quarterly technical report, along with CNEP tables of all the data. The data tables were compiled to facilitate the discovery and analysis of any seasonal trends in the data. ERG will post the data for September 26th through December 31st, 2006 to the AQS website by the end of March, 2007.

4. Kent Curtis of CNEP will attend the EPA Region 6 Regional Air Monitoring Conference. Kent attended the EPA Region 6 Regional Air Monitoring Conference in Albuquerque on March 6-8, 2007, giving a presentation about the CNEP Community Air Toxics Project. Kent also attended the Air Toxics Training Workshop in Durham, North Carolina on December 12-14, 2006.

Summary of Third Quarter Goals, Objectives, and Accomplishments. The goals and objectives of this project, including overall goals, have not changed from the original CNEP application for funding. Third quarter goals and objectives for this project were to continue sample collection, analyze sample data, obtain NATTS certification for the CNEP's backup RM910A sampler, and send CNEP staff to technical conferences and trainings pertaining to air toxics monitoring. These goals and objectives have been met. No significant difficulties or delays were encountered in meeting these second quarter goals and objectives. In summary, work for this project is on schedule.

Project Timeline and Milestones. The following list shows the timeline and milestones for the entire two-year duration of this project. *Milestones that have been met are shown in italics.*

(1) Cherokee Nation will receive EPA approval of its QAPP for this project by June 1, 2006, or by the end of the second month of the project. *The original QAPP/Work Plan for this project was approved by the EPA in February, 2006. The CNEP revised this original QAPP in September, 2006, and the revised QAPP was approved by EPA on October 26, 2006.*

(2) Cherokee Nation will solicit bids from labs for sample analysis during the first month of the project and will select the winning bid and award the contract by the beginning of the third month of the project. *ERG was selected (August, 2006) to analyze project samples and perform data reporting for the project.*

(3) Cherokee Nation will begin sample collection by the beginning of the third month (September, 2006) of the project, or by the date of project QAPP approval by EPA, whichever is later. *Sample collection for this project began on September 26, 2006. As of March 13, 2007, twenty-seven samples (plus three duplicate samples) had been collected for this project.*

(4) Cherokee Nation will begin data analysis as soon as the first data is received from lab. Data analysis will continue to the end of the project on May 31, 2008. *The CNEP*

began receiving lab data from ERG in December, 2006. As of March, 2007, the CNEP had analyzed ERG data for the first twenty samples – collected from September 26, 2006 through January 30, 2007. Data analysis will be an ongoing activity until the end of this project in May, 2008.

(5) Cherokee Nation will complete sample collection by the end of 18 months of sampling (March, 2008).

(6) ERG will submit sample data to CNEP within 45 days after the end of each month of sample collection. ERG will submit statistical analyses of data and quality assurance reports to CNEP at the end of each year of the project. *ERG began submitting sample data to the CNEP in December, 2006 (see Project Timeline and Milestone item 4 above).*

(7) ERG, under the terms of its contract with CNEP, will post project data to AQS within 90 days of the end of each calendar quarter. Posting of project data to AQS will begin as early as the 9th month (March, 2007) of the project. ERG will complete final posting of project data to AQS within 90 days after the conclusion of the project on May 31, 2008.

(8) Cherokee Nation will host public meeting to present results of project to residents of Cherokee Heights no later than the final month of the project (May, 2008).

(9) Cherokee Nation will submit final project report to EPA within 90 days after the conclusion of the project on May 31, 2008. Quarterly technical reports will be submitted to EPA within 30 days after the end of each three-month quarter of each fiscal year.

CHANGES IN KEY PERSONNEL INVOLVED IN PROJECT

The following six persons in the CNEP air quality monitoring program are working on this project:

Ryan Callison, Project Manager
Kent Curtis, Project QA/QC Manager
April Hathcoat, Environmental Specialist II
Jacque Adam, Environmental Specialist I
Jeremy Freise, Environmental Specialist I
Danielle Keese, Environmental Technician

Ryan has overall responsibility for the project. Kent is responsible for project planning, project oversight, and QA/QC management. Kent and April are responsible for project data management. April, Jacque, Jeremy, and Danielle have primary responsibility for sample collection and equipment maintenance, while Kent and Ryan may also assist with such tasks. Amber McCurtain left the CNEP in December, 2006.

ERG is the laboratory responsible for sample analyses and data reporting for the project. Key contacts at ERG are Julie Swift (project oversight), Ray Merrill (QA oversight), Dave Dayton (Method TO-15 canister sampling system certification), and Rodney Williams (canister sample shipping and receiving).

Figure 2 is an organizational chart showing all parties involved in this project. Those personnel named in the preceding paragraphs are directly involved in this project while other parties shown in **Figure 2** play supporting roles in the project.

EXPENDITURES TO DATE

A total of $97,944 of the $165,000 awarded for this grant was spent or obligated by the CNEP by the end of the third quarter of this project. Most of the money spent or obligated was for one-time expenditures: $47,520 obligated to ERG for the performance of sample analyses and data reporting during the period from September, 2006 through May, 2008; and $4,522 obligated to RM Environmental, Inc. for a backup RM910A sampler and spare parts (seals, etc.) for the primary RM910A sampler. The remaining expenditures through the end of the third quarter were $15,488 for salaries, $11,404 for fringe benefits, $1,055 for travel, $2,091 for supplies (including two Restek sample canisters), $8,346 for other costs, and $7,118 for indirect costs. Thus expenditures and obligations through the end of the third quarter are within the overall budget for the project. In other words, expenditures for salaries, fringe benefits, indirect costs, and other expenses are not expected to exceed the total awarded for the two-year life of the grant.

COMPLIANCE WITH QUALITY ASSURANCE REQUIREMENTS

The CNEP's original QAPP/Work Plan for this project was approved by the EPA in February, 2006. A revision of this QAPP was completed by the CNEP on September 21, 2006 and was approved by the EPA on October 26, 2006.

In addition, the CNEP is operating under a Quality Management Plan (QMP) approved by the EPA on May 30, 2006. The CNEP air quality monitoring program is also operating under several other EPA-approved QAPPs, including QAPPs for criteria pollutant monitoring (including meteorological instruments) and for PM2.5 and PM10 monitoring.

Renew

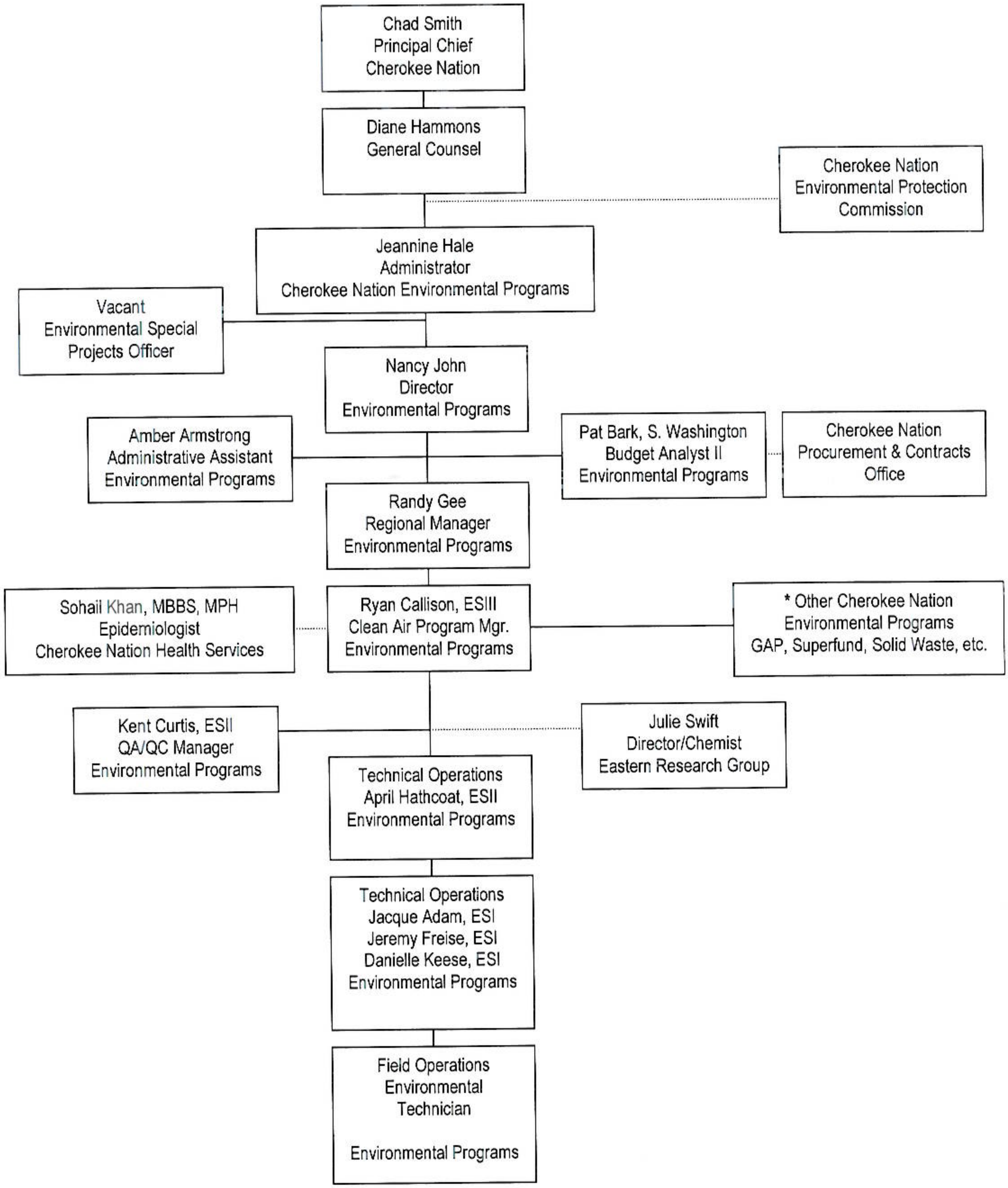
The contracted laboratory, ERG, is operating under the following EPA-approved QAPP: *Support for the EPA National Monitoring Programs (NMOC, UATMP, PAMS, HAPs, and NATTS).* EPA approval for ERG's updated QAPP for 2006/2007 is pending.

RESULTS TO DATE

Twenty-seven samples (plus three duplicates) were collected from September 26, 2006 through March 13, 2007 (see first two pages of **Appendix A** in this quarterly technical report). All but two of these samples produced valid sample data. ERG has submitted data for the first twenty samples – collected from September 26, 2006 through January 30, 2007 – to the CNEP and the CNEP has analyzed this data. The CNEP's Data Summary reports are included in **Appendix B** of this quarterly technical report, along

Cherokee Nation Environmental Programs
Organizational Chart

Figure 2



Note: *Chart shows only those CNEP staff directly involved in the Community Air Toxics Project

Air Toxic History by Award Classifications

Air Toxics Summary

Award Category		Actual	Encumbrance	Total	Budget	Balance
Personnel	31,769.00	15,487.72	0.00	15,487.72	39,684.00	**24,196.28**
Fringe	11,078.00	11,404.20	0.00	11,404.20	13,144.00	**1,739.80**
Travel	9,011.00	1,055.28	0.00	1,055.28	10,770.00	**9,714.72**
Contractual	77,000.00	6,732.00	41,188.00	47,920.00	77,300.00	**29,380.00**
Supplies	3,400.00	2,091.17	0.00	2,091.17	3,500.00	**1,408.83**
Equipment	6,995.00	4,522.00	0.00	4,522.00	0.00	**(4,522.00)**
Other	13,600.00	7,385.82	960.00	8,345.82	7,407.00	**(938.82)**
IDC	12,147.00	7,118.25	0.00	7,118.25	13,195.00	**6,076.75**
	165,000.00	**55,796.44**	**42,148.00**	**97,944.44**	**165,000.00**	**67,055.56**

with CNEP tables of all the data. The data tables were compiled to facilitate the discovery and analysis of any seasonal trends in the data. ERG will post the data for September 26th through December 31st, 2006 to the AQS website by the end of March, 2007.

The number of VOCs detected in each of the first twenty samples ranged from 14 to 30. The concentrations of the detected VOCs were compared to the following benchmarks: EPA Region 6 Human Health Medium-Specific Screening Levels, including chronic inhalation toxicity values (non-cancer and cancer values), and including screening values for ambient air; Oklahoma Department of Environmental Quality (ODEQ) MAACs; and ATSDR Minimal Risk Levels (MRLs) for inhalation. The concentrations of 3 to 7 of the detected VOCs equaled or exceeded one or more of these benchmarks in each sample. The VOCs exceeding these benchmarks were as follows: acrolein; chloromethane; 1,3-butadiene; chloroform; benzene; carbon tetrachloride; trichloroethylene; and 1,2-dichloroethane. A more detailed analysis of these results is included in **Appendix B** of this quarterly technical report.

PROBLEMS ENCOUNTERED

No serious problems were encountered during the third quarter of this project. Two minor problems that occurred during the third quarter are described here.

Two samples – collected on December 1st and December 25th – were invalid (unuseable) because the sample canisters had internal pressures of zero at the end of sample collection. To produce valid sample results, a canister must have an internal pressure that is either negative or positive at the end of the sample collection period. A final canister pressure of zero suggests that a canister lost pressure some time after the conclusion of the sampling event. If such a pressure loss occurred, then the sample may have been contaminated with air from either inside or outside the building housing the sampling apparatus, or sampled air and contaminants may have escaped from the canister.

The sample collected on December 1st had a final canister pressure of +2 when it was shipped to ERG for analysis, but it had a canister pressure of zero when it arrived at ERG. The cause of this pressure change during shipment to ERG is unknown. The sample collected on December 25th had a final canister pressure of zero when CNEP personnel shipped it ERG. The reason the final pressure was zero instead of negative or positive is unknown. A possible cause may include operator error during setup or retrieval of the sample canister, which could result in a loose connection between the sample canister and the tubing leading from the canister to the RM910A sampler. The QA/QC Manager (Kent Curtis) for this project is monitoring the situation in an attempt to identify and correct the cause of the problem.

Method Detection Limits (MDLs) reported by ERG for samples collected on December 31, 2006 and on January 6th, 12th, 18th, and 30th, 2007 were higher than the MDLs reported for all other samples collected for this project. Fourteen of these higher MDLs are higher than the EPA Region 6 Human Health Screening Levels to which project data are being compared. If possible, the MDLs for all VOCs included in this project should be *lower* than the Screening Levels. If MDLs are *higher* than these Screening Levels, then it is likely that false negatives will be reported for VOCs of particular concern in this project. That is, data may falsely show that a particular VOC is not present at a concentration higher than a Screening Level when, in fact, that VOC may actually be present at a concentration higher than the Screening Level but lower than the MDL achieved by the lab. [See Data Summary in **Appendix B** for further discussion of this problem.] The CNEP is conferring with ERG to determine the cause of the higher MDLs reported for the five samples cited above and to reduce the MDLs to concentrations that are lower than the EPA Screening Levels. These efforts are essential to reduce the probability of false negatives appearing in data for this project.

Of the first 32 samples collected (including three duplicates) from September 26, 2006 through March 13, 2007, 30 samples yielded valid (useable) data. Thus the data completion rate for the first six months of sample collection is 93.75%. This meets the desired data completion rate of 85%, which is specified in Section 2.5 of the Revised QAPP/Work Plan for this project.

ACTIVITIES PLANNED FOR FOURTH QUARTER OF THIS PROJECT

1. Continue sample collection in accordance with the Proposed Sampling Schedule for this project (see **Appendix A** of this quarterly technical report).

2. The CNEP will continue working with ERG to reduce the MDLs of 14 VOCs of concern to concentrations that are lower than EPA Region 6 Human Health Screening Levels.

3. The CNEP will perform a flow verification check on its NATTS-certified backup RM910A sampler.

4. ERG will continue reporting sample data to the CNEP at monthly intervals. ERG, under the terms of its contract with CNEP, will post project data to AQS within 90 days of the end of each calendar quarter. Posting of project data to AQS will begin as early as the 9th month (March, 2007) of the project.

5. Kent Curtis of CNEP will attend the Air and Waste Management Association's Measurement Methods and Technology Conference in San Francisco on April 30-May 2, 2007. He will give a brief presentation on the CNEP's Community Air Toxics Project.

PUBLICATIONS ARISING FROM THIS PROJECT

The CNEP will present the results of this project at one or more regional or national conferences as project data become available. Such presentations will occur in 2007 and 2008. There are no plans at this time to publish the final results of this project. FYI → Tribe giving some type of presentation @ an air toxics meet (Kuwanyin atten

The CNEP will share data from this project with the Cherokee Nation's Health Services department. The CNEP and the CN Health Services may jointly host a public meeting to present results of this project to residents of Cherokee Heights no later than the final month of the project (May, 2008).

APPENDIX A

PROPOSED SAMPLING SCHEDULE FOR THIS PROJECT

PROPOSED SAMPLE DATES FOR AIR TOXICS PROJECT AT PRYOR, 2006-2008

There are 92 sample dates, with duplicate samples being collected on 10 of those dates. There are 102 samples in all.
Sample dates correspond to the EPA's 1-in-6 day sampling schedule used for ambient particulate monitoring.
Dates for duplicate samples were selected randomly by using a random number table.

CNEP Sample Number	CNEP Canister Number	Lab Sample Number	Sample Date				Duplicate Sample	Notes
			Month	Day	Year	Day of Week		
1	2280	2280	September	26	2006	Tue		
2A	2275	2275	October	2	2006	Mon		
2B	2272	2272	October	2	2006	Mon	Yes	
3	2276	2276	October	10	2006	Tue		Make-up for sample that didn't run on 10/8
4	2284	2284	October	18	2006	Wed		Make-up for sample that didn't run on 10/14
5	3357	3357	October	20	2006	Fri		Graseby canister
6	3359	3359	October	26	2006	Thur		Graseby canister; shelter temp 130 on 10/24
7	2275	2275	November	1	2006	Wed		
8A	2272	2272	November	7	2006	Tue		
8B	2280	2280	November	7	2006	Tue	Yes	
9	2276	2276	November	13	2006	Mon		
10	2284	2284	November	19	2006	Sun		
11	3357	3357	November	25	2006	Sat		Graseby canister
12	3359	3359	December	1	2006	Fri		Graseby canister, +2 final canister pressure at Pryor, 0 at ERG; INVALID SAMPLE
13	2275	2275	December	7	2006	Thur		
14	2272	2272	December	13	2006	Wed		
15	2280	2280	December	19	2006	Tue		
16	3627	3627	December	25	2006	Mon		0 final canister press.; INVALID SAMPLE
17	3628	3628	December	31	2006	Sun		New Year's Eve
18	2275	2275	January	6	2007	Sat		
19A	2284	2284	January	12	2007	Fri		
19B	2272	2272	January	12	2007	Fri	Yes	
20	2276	2276	January	18	2007	Thur		
21	2280	2280	January	24	2007	Wed		

PROPOSED SAMPLE DATES FOR AIR TOXICS PROJECT AT PRYOR, 2006-2008

There are 92 sample dates, with duplicate samples being collected on 10 of those dates. There are 102 samples in all. Sample dates correspond to the EPA's 1-in-6 day sampling schedule used for ambient particulate monitoring. Dates for duplicate samples were selected randomly by using a random number table.

CNEP Sample Number	CNEP Canister Number	Lab Sample Number	Sample Date				Duplicate Sample	Notes
			Month	Day	Year	Day of Week		
22	3627	3627	January	30	2007	Tue		
23	3628	3628	February	5	2007	Mon		
24	2272	2272	February	11	2007	Sun		
25	2284	2284	February	17	2007	Sat		
26	2276	2276	February	23	2007	Fri		
27	2280	2280	March	1	2007	Thur		
28	3627	3627	March	7	2007	Wed		
29	2284	2284	March	13	2007	Tue		
30	2272	2272	March	19	2007	Mon		
31	3628	3628	March	25	2007	Sun		
32	2276	2276	March	31	2007	Sat		
33			April	6	2007	Fri		
34			April	12	2007	Thur		
35A			April	18	2007	Wed		
35B			April	18	2007	Wed	Yes	
36			April	24	2007	Tue		
37A			April	30	2007	Mon		
37B			April	30	2007	Mon	Yes	
38			May	6	2007	Sun		
39			May	12	2007	Sat		
40			May	18	2007	Fri		
41			May	24	2007	Thur		
42			May	30	2007	Wed		
43			June	5	2007	Tue		

PROPOSED SAMPLE DATES FOR AIR TOXICS PROJECT AT PRYOR, 2006-2008

There are 92 sample dates, with duplicate samples being collected on 10 of those dates. There are 102 samples in all. Sample dates correspond to the EPA's 1-in-6 day sampling schedule used for ambient particulate monitoring. Dates for duplicate samples were selected randomly by using a random number table.

CNEP Sample Number	CNEP Canister Number	Lab Sample Number	Sample Date				Duplicate Sample	Notes
			Month	Day	Year	Day of Week		
44			June	11	2007	Mon		
45			June	17	2007	Sun		
46A			June	23	2007	Sat		
46B			June	23	2007	Sat	Yes	
47			June	29	2007	Fri		
48			July	5	2007	Thur		
49			July	11	2007	Wed		
50			July	17	2007	Tue		
51			July	23	2007	Mon		
52			July	29	2007	Sun		
53A			August	4	2007	Sat		
53B			August	4	2007	Sat	Yes	
54			August	10	2007	Fri		
55			August	16	2007	Thur		
56			August	22	2007	Wed		
57			August	28	2007	Tue		
58			September	3	2007	Mon		Labor Day
59			September	9	2007	Sun		
60			September	15	2007	Sat		
61			September	21	2007	Fri		
62			September	27	2007	Thur		
63A			October	3	2007	Wed		
63B			October	3	2007	Wed	Yes	
64			October	9	2007	Tue		

PROPOSED SAMPLE DATES FOR AIR TOXICS PROJECT AT PRYOR, 2006-2008

There are 92 sample dates, with duplicate samples being collected on 10 of those dates. There are 102 samples in all. Sample dates correspond to the EPA's 1-in-6 day sampling schedule used for ambient particulate monitoring. Dates for duplicate samples were selected randomly by using a random number table.

CNEP Sample Number	CNEP Canister Number	Lab Sample Number	Sample Date				Duplicate Sample	Notes
			Month	Day	Year	Day of Week		
65			October	15	2007	Mon		
66			October	21	2007	Sun		
67			October	27	2007	Sat		
68			November	2	2007	Fri		
69			November	8	2007	Thur		
70			November	14	2007	Wed		
71			November	20	2007	Tue		
72			November	26	2007	Mon		
73			December	2	2007	Sun		
74			December	8	2007	Sat		
75			December	14	2007	Fri		
76			December	20	2007	Thur		
77			December	26	2007	Wed		
78			January	1	2008	Tue		NY Day
79			January	7	2008	Mon		
80A			January	13	2008	Sun		
80B			January	13	2008	Sun	Yes	
81			January	19	2008	Sat		
82			January	25	2008	Fri		
83			January	31	2008	Thur		
84			February	6	2008	Wed		
85			February	12	2008	Tue		
86			February	18	2008	Mon		
87			February	24	2008	Sun		

PROPOSED SAMPLE DATES FOR AIR TOXICS PROJECT
AT PRYOR, 2006-2008

There are 92 sample dates, with duplicate samples being collected on 10 of those dates. There are 102 samples in all.
Sample dates correspond to the EPA's 1-in-6 day sampling schedule used for ambient particulate monitoring.
Dates for duplicate samples were selected randomly by using a random number table.

CNEP Sample Number	CNEP Canister Number	Lab Sample Number	Sample Date				Duplicate Sample	Notes
			Month	Day	Year	Day of Week		
88			March	1	2008	Sat		
89			March	7	2008	Fri		
90A			March	13	2008	Thur		
90B			March	13	2008	Thur	Yes	
91			March	19	2008	Wed		
92			March	25	2008	Tue		

APPENDIX B

CNEP DATA SUMMARY REPORTS
AND DATA TABLES
FOR SAMPLES COLLECTED FROM
SEPTEMBER 26, 2006 THROUGH JANUARY 30, 2007

DATA SUMMARY
FOR VOC SAMPLES COLLECTED AT CHEROKEE NATION'S PRYOR SITE
FROM SEPTEMBER 26 THROUGH DECEMBER 31, 2006

I have analyzed the data for our first nineteen VOC samples, which were collected from September 26 through December 31, 2006. The following is a summary of my analyses.

17 samples are valid samples, as the canisters had final pressures that were less than zero. Two samples collected in December (December 1 and December 25) were invalid samples because the final canister pressure was zero, either when the canister was collected in the field or when the canister arrived at ERG. Data completeness (17 valid samples out of 19 total samples) = 89%. This exceeds the desired data completion rate of 85%.

ERG analyzed each of the 17 valid samples for 60 VOCs.

The number of VOCs detected in each sample ranged from 18 (December 31) to 30 (October 10 and November 19).

I compared the concentrations of detected VOCs to the following benchmarks:

EPA Region 6 Human Health Medium-Specific Screening Levels
  Chronic inhalation toxicity values (non-cancer and cancer values)
  Region 6 Screening values for ambient air
Oklahoma Department of Environmental Quality (ODEQ) MAACs
ATSDR Minimal Risk Levels (MRLs) for inhalation

3 to 7 detected VOCs equalled or exceeded one or more of these benchmarks in each sample. The VOCs exceeding these benchmarks were as follows:

Acrolein, exceeding a benchmark in 15 samples, with a concentration range in these fifteen samples of 0.39 to 4.3 ug/m3.

Chloromethane, exceeding a benchmark in 9 samples, with a concentration range in these nine samples of 1.1 to 1.49 ug/m3.

1,3-Butadiene, exceeding a benchmark in 6 samples, with a concentration of 0.04 ug/m3 in all six samples.

Chloroform, exceeding a benchmark in 9 samples, with a concentration of 0.10 ug/m3 in all nine samples.

Benzene, exceeding a benchmark in all 17 valid samples, with a concentration range in these seventeen samples of 0.32 to 0.90 ug/m3.

Carbon tetrachloride, exceeding a benchmark in all 17 valid samples, with a concentration range in these seventeen samples of 0.50 to 1.01 ug/m3.

Trichloroethylene, exceeding a benchmark in 6 samples, with a concentration range in these six samples of 0.05 to 0.54 ug/m3.

1,2-Dichloroethane, exceeding a benchmark in 1 sample, with a concentration in this sample of 0.12 ug/m3.

Chloromethane, chloroform, trichloroethylene, and 1,2-dichloroethane exceeded only screening levels.

Benzene and carbon tetrachloride exceeded both screening levels and cancer benchmarks.

1,3-Butadiene exceeded a cancer benchmark.

Acrolein exceeded both screening levels and a non-cancer benchmark. In addition, acrolein was the only VOC to exceed both the ODEQ MAAC and the ATSDR MRL.

Results for the two duplicate samples collected on October 2 were good. Only 5 of the 28 detected VOCs had a relative percent difference (RPD) greater than 20%, and none of these 5 VOCs exceeded a benchmark.

Results for the two duplicate samples collected on November 7 were good. Only 5 of the 25 detected VOCs had a relative percent difference (RPD) greater than 20%, but one of these 5 VOCs was acrolein, which exceeded a benchmark. The RPD for acrolein in the two duplicate samples was 20.29%.

The benzene/toluene ratios in the seventeen valid samples ranged from 0.58 to 1.68. These ratios are NOT characteristic of vehicular (gasoline engine) emissions.

The concentrations of carbon tetrachloride and chlorofluorocarbons [Dichlorodifluoromethane (freon 12), Dichlorotetrafluoroethane (freon 114), and Trichlorofluoromethane (freon 11)] detected in the seventeen samples were relatively stable. The concentration ranges of each of these VOCs in the seventeen samples were as follows: carbon tetrachloride (0.50 to 1.01 ug/m3); Freon 12 (2.08 to 3.02 ug/m3); Freon 114 (0.07 to 0.14 ug/m3); and Freon 11 (1.18 to 1.69 ug/m3). This is consistent with the fact that such VOCs have stable global background concentrations in the USA.

It's interesting to note that the two samples collected in Graseby canisters (canister 3357on October 20 and canister 3359 on October 26) were the only two samples in which Acrolein was NOT detected. However, Acrolein WAS detected in Graseby canister 3357 on November 25. The other thirteen samples were collected in Restek canisters. In addition, the invalid sample collected on December 1 was collected in Graseby canister 3359, which was exposed to excessive shelter temperatures on October 24, as described in the following paragraph. We have removed the two Graseby canisters from our sample canister rotation.

There was no discernible effect of excessive temperature on the sample collected on October 26. This canister had been exposed to a shelter temperature of > 130 degrees Fahrenheit when the air conditioner failed on October 24. Nevertheless, this was a Graseby canister (canister 3359). When this same canister was used to collect a sample on December 1, it had a final field canister pressure of +2, and it had a pressure of zero when it arrived at ERG. Thus the sample collected in Graseby canister 3359 on December 1 was an invalid sample. This raises the question: was Graseby canister 3359 damaged by the excessive shelter temperature it was exposed to on October 24?

There were no exceedances of NAAQS standards (24-hour or 8-hour standard, as applicable) for NO2, SO2, PM10, PM2.5, and ozone at the Pryor station on any of the seventeen scheduled VOC sample days.

Finally, the wind direction on each of the first six sample dates (September 26 through October 26) was consistently from the E, SE, S, SW, and/or W at speeds ranging from 1 to 9 mph. The wind direction on each of the five sample dates in November (November 1 through 25) ranged consistently from the NE, E, SE, S, SW, W, and/or NW at speeds ranging from zero to 10 mph. The wind direction on the four valid sample days in December (December 7 through 31) was consistently from the E, SE, and/or S at speeds ranging from zero to 13 mph. The Cherokee Heights tribal housing complex and the city of Locust Grove lie to the east and southeast of the Pryor monitoring station; U. S. highway 412 lies south of the station; Mid-America Industrial Park lies to the west, southwest, and northwest of the station; and other industry lies to the northeast of the station. There was no rainfall on thirteen of the fourteen valid sample dates. A total of 0.35-inch of rain fell from 7 pm to midnight on the December 19 sample date. Ambient air temperatures ranged from a low of 14 degrees F on December 7 to a high of 89 degrees F on October 2.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS

Analysis of the 17 valid samples collected from September 26 to December 31, 2006 revealed no obvious seasonal trends in occurrences or concentrations of VOCs (see attached Table of seasonal trends data). Particular VOCs did not appear or disappear with the changing seasons, and the concentrations of detected VOCs did not show a tendency to rise or fall with the changing seasons. The concentrations of detected VOCs remained steady, fluctuating within a narrow range of concentrations that showed little or no change with the seasons. The concentrations of some VOCs remained remarkably constant, perhaps because they were present only at concentrations that were very close to the method detection limits that the lab (ERG) could achieve.

Of the eight VOCs that exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more valid samples, only acrolein showed a very slight tendency to change in concentration with the seasons. Acrolein was present at its highest concentrations in September and early October, then declined very slightly in concentration after mid-October. Six of the other seven VOCs showed no tendency to rise or fall in concentration with the changing seasons, while the seventh VOC (1,2-dichloroethane) was detected in only one sample (November 25).

ERG analyzed each of the 17 valid samples for a suite of 60 VOCs (see attached Table of seasonal trends data). 18 VOCs were detected in all 17 valid samples, while 10 other VOCs were detected in 10 to 16 samples. Of the eight VOCs that exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more valid samples, acrolein, chloromethane, benzene, and carbon tetrachloride were detected in all 17 samples, while chloroform and 1,3-butadiene were detected in 16 and 10 samples, respectively.

Conversely, 26 VOCs were undetected in all 17 samples, while the remaining six VOCs were detected in only 1 to 6 samples. Of the eight VOCs that exceeded a health-based benchmark, TCE was detected in only 6 samples, while 1,2-dichloroethane was detected in only 1 sample.

There are relatively stable global background concentrations of carbon tetrachloride and chlorofluorocarbons (such as freons) in the atmosphere. Therefore, it was no surprise that carbon tetrachloride and the four chlorofluorocarbons included in sample analyses for this project were detected in all 17 valid samples at concentrations that showed no tendency to vary with the changing seasons.

VOC concentrations in three samples collected on one Saturday and two Sundays did not appear to differ significantly from VOC concentrations in samples collected on week days. The only possible exceptions to this generalization are 1,2-dichloroethane, which was detected in only one sample collected on Saturday, November 25, and TCE, which was present at its highest concentration (0.54 μg/m3) in the sample collected on Sunday, December 31. This TCE concentration was significantly higher than the next highest TCE concentration of 0.11 μg/m3. Thus there are few, if any, noticeable changes in VOC concentrations on weekends, when industrial activity at Mid-America Industrial Park and other nearby industries might be expected to decline.

In summary, only three months of VOC data have been collected so far, with all of that data being for the autumn, 2006 season. Data for the winter, spring, and summer seasons must still be collected before any seasonal trends in the occurrences and concentrations of VOCs can be identified.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Acetylene	0.26	0.17 0.16	0.33	1.44	0.35	0.34	0.29	0.60 0.61	0.56	0.76	0.32	1.00	0.26	0.27	0.22
Propylene	1.41	2.16 2.22	0.95	0.83	0.35	0.16	0.31	0.60 0.69	0.93	0.78	0.17	0.78	0.60	0.52	0.57
Dichlorodifluoromethane (Freon 12)	2.23	2.63 2.58	2.48	2.53	3.02	2.68	2.38	2.73 2.68	2.58	2.28	2.82	2.58	2.18	2.08	2.08
Chloromethane	0.99	**1.30** **1.24**	1.03	**1.10**	**1.49**	**1.37**	1.01	**1.22** **1.22**	1.01	0.91	**1.45**	**1.10**	0.85	0.77	0.79
Dichlorotetrafluoroethane (Freon 114)	0.07	0.14 0.07	0.14	0.14	0.14	0.14	0.07	0.14 0.14	0.14	0.14	0.14	0.14	0.14	0.07	0.07
Vinyl Chloride	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	0.03
1,3-Butadiene	0.02	ND ND	**0.04**	**0.04**	**0.04**	ND	0.02	ND ND	**0.04**	**0.04**	ND	**0.04**	0.02	0.02	ND
Bromomethane	0.04	0.04 0.04	0.08	0.08	0.04	0.08	0.04	0.04 0.04	0.08	0.04	0.08	0.04	0.04	0.04	0.04

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in this sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Chloroethane	0.08	0.11 0.11	0.05	0.05	0.08	0.05	0.03	0.05 0.05	0.05	0.05	0.08	ND	0.03	0.03	0.03
Acetonitrile	0.32	0.45 0.45	0.27	0.22	0.10	ND	0.12	0.15 0.15	0.17	0.14	0.12	ND	0.19	0.22	0.10
Acrolein	**4.27**	**4.30** **3.77**	**3.42**	**1.54**	0.23	0.18	**0.80**	**1.52** **1.24**	**3.93**	**3.10**	**0.39**	**1.93**	**1.29**	**2.39**	**1.98**
Trichlorofluoromethane (Freon 11)	1.29	1.52 1.46	1.41	1.46	1.69	1.46	1.29	1.52 1.46	1.52	1.35	1.69	1.52	1.29	1.24	1.18
Acrylonitrile	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Dichloromethane (Methylene Chloride)	0.14	0.14 0.14	0.24	0.21	0.17	0.21	0.17	0.21 0.24	0.21	0.21	0.24	0.17	0.14	0.17	0.14
Carbon Disulfide	0.06	0.09 0.09	0.06	0.09	0.06	ND	0.06	ND ND	0.06	0.09	0.13	ND	ND	0.03	0.19

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	**Valid Sample Dates ****														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Trichlorotrifluoroethane	0.69	0.77 0.77	0.69	0.77	0.85	0.77	0.61	0.77 0.69	0.69	0.69	0.92	0.77	0.69	0.69	0.69
Trans-1,2-Dichloroethylene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-Butyl Ether	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Methyl Ethyl Ketone	10.20	10.80 11.20	8.90	3.28	0.65	0.53	1.83	3.43 3.49	14.20	8.48	1.27	4.79	4.40	4.82	4.46
Chloroprene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Chloroform	**0.10**	0.05 0.05	**0.10**	**0.10**	**0.10**	**0.10**	0.05	**0.10** 0.05	**0.10**	**0.10**	**0.10**	ND	0.05	0.05	0.10
Ethyl tert-Butyl Ether	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	**0.12**	ND	ND	ND	ND
1,1,1-Trichloroethane	0.11	0.11 0.11	0.11	0.11	0.11	0.11	0.11	0.11 0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.05
Benzene	**0.42**	**0.32** **0.32**	**0.64**	**0.64**	**0.64**	**0.67**	**0.32**	**0.58** **0.54**	**0.64**	**0.90**	**0.80**	**0.67**	**0.42**	**0.48**	**0.35**
Carbon Tetrachloride	**0.82**	**1.01** **1.01**	**0.63**	**0.69**	**0.82**	**0.88**	**0.76**	**1.01** **0.88**	**0.76**	**0.63**	**0.88**	**0.76**	**0.50**	**0.57**	**0.50**
tert-Amyl Methyl Ether	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.05	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND

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** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Ethyl Acrylate	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene (TCE)	ND	**0.11** ND	**0.05**	**0.11**	ND	ND	**0.11**	ND ND	ND	**0.11**	ND	ND	ND	ND	**0.54**
Methyl Methacrylate	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Methyl Isobutyl Ketone	1.81	1.60 1.81	1.52	0.66	0.12	ND	0.37	0.78 0.62	1.52	0.74	0.16	0.58	0.33	0.45	0.49
trans-1,3-Dichloropropene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Toluene	0.49	0.23 0.19	1.10	0.83	0.49	0.42	0.34	0.53 0.57	0.83	1.25	0.57	0.57	0.49	0.64	0.30
Dibromochloromethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
n-Octane	0.23	0.14 0.09	0.28	0.14	0.14	0.09	0.09	0.09 0.09	0.23	0.19	0.14	ND	0.14	0.05	0.09
Tetrachloroethylene	0.07	ND ND	0.07	ND	ND	ND	ND	ND ND	ND	0.14	ND	ND	0.07	0.07	0.07
Chlorobenzene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.09	0.04 0.04	0.22	0.17	0.13	0.09	0.09	0.09 0.09	0.17	0.26	0.09	0.13	0.09	0.04	0.04
m,p-Xylene	0.26	0.09 0.13	0.57	0.44	0.22	0.13	0.22	0.22 0.17	0.39	0.61	0.17	0.26	0.17	0.09	0.09

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

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VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
Bromoform	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	0.04 0.04	0.17	0.13	0.09	0.09	0.04	0.09 0.09	0.21	0.17	0.09	0.09	ND	ND	0.26
1,1,2,2-Tetrachloroethane	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	0.13	0.09 0.04	0.26	0.22	0.13	0.09	0.09	0.13 0.09	0.17	0.31	0.09	0.13	0.09	0.04	0.04
1,3,5-Trimethylbenzene	0.05	0.05 ND	0.10	0.05	0.05	0.05	0.05	0.05 0.05	0.10	0.10	0.05	0.05	ND	ND	ND
1,2,4-Trimethylbenzene	0.10	0.10 0.15	0.30	0.20	0.10	0.10	0.10	0.10 0.10	0.20	0.30	0.10	0.15	0.05	ND	0.05
m-Dichlorobenzene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Chloromethylbenzene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS
26 September to 31 December, 2006

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	**Valid Sample Dates **** Tues 9/26	Mon 10/2	Tues 10/10	Wed 10/18	Fri 10/20	Thurs 10/26	Wed 11/1	Tues 11/7	Mon 11/13	**Sun 11/19**	**Sat 11/25**	Thurs 12/7	Wed 12/13	Tues 12/19	**Sun 12/31**
p-Dichlorobenzene	ND	ND ND	0.06	ND	ND	ND	ND	ND ND	ND	0.06	ND	ND	ND	ND	ND
o-Dichlorobenzene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND
Hexachloro-1,3-Butadiene	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in sample.

DATA SUMMARY
FOR VOC SAMPLES COLLECTED AT CHEROKEE NATION'S PRYOR SITE
FROM JANUARY 6 THROUGH JANUARY 30, 2007

I have analyzed the data for our first six VOC samples of the winter season, which were collected from January 6 through January 30, 2007. The following is a summary of my analyses.

All 6 samples are valid samples, as the canisters had final pressures that were less than zero. Data completeness (6 valid samples out of 6 total samples) = 100%. This exceeds the desired data completion rate of 85%.

ERG analyzed each of the 6 valid samples for 60 VOCs.

The number of VOCs detected in each sample ranged from 14 (January 30) to 26 (January 24). The average number of VOCs detected in each sample was 18.2, which was lower than the average of 26.1 VOCs detected in the 17 valid samples collected during the autumn of 2006.

The lab (ERG) reported higher MDLs for 55 of the 60 VOCs in five of the six samples analyzed in January. That is, MDLs for 55 of the 60 VOCs were higher in January than they had been in all but one of the samples collected from September through December, 2006. Consequently, the average number of VOCs detected at concentrations above the MDL in the January samples was only 18.2, which, as mentioned in the previous paragraph, was lower than the average of 26.1 VOCs detected at concentrations above the lower MDLs achieved for the autumn, 2006 samples. The effect of higher MDLs on sample results is obvious when the data for the January 24 sample are examined. 26 VOCs were detected at concentrations above the lower MDLs achieved for the January 24 sample. This number of detected VOCs was considerably higher than the 18 or fewer VOCs detected in the other five January samples for which the higher MDLs were achieved.

The higher MDLs achieved for the January samples resulted in a greater number of those MDLs being higher than one of the EPA Region 6 Human Health Medium-Specific Screening Levels of concern. [These screening levels are described in the following paragraph.] 8 of the lower MDLs achieved for VOCs in samples collected in the autumn of 2006 were higher than one of these screening levels, whereas 14 of the higher MDLs achieved for VOCs in samples collected in January were higher than one of these screening levels. **This increase of six MDLs exceeding a screening level is of concern because it includes the MDLs for 1,3-butadiene, chloroform, carbon tetrachloride, and 1,2-dichloroethane – four of the VOCs that exceeded a screening level in one or more samples collected in the autumn of 2006. These higher MDLs make it more likely that false negatives will be reported for VOCs of particular concern. The probability of false negatives must be reduced in future sample analyses.**

I compared the concentrations of detected VOCs in the January samples to the following benchmarks:

- EPA Region 6 Human Health Medium-Specific Screening Levels
  - Chronic inhalation toxicity values (non-cancer and cancer values)
  - Region 6 Screening values for ambient air
- Oklahoma Department of Environmental Quality (ODEQ) MAACs
- ATSDR Minimal Risk Levels (MRLs) for inhalation

3 to 4 detected VOCs equalled or exceeded one or more of these benchmarks in each sample. The VOCs exceeding these benchmarks were as follows:

Acrolein, exceeding a benchmark in all 6 valid samples, with a concentration range in these six samples of 0.97 to 1.59 ug/m3.

Chloromethane, exceeding a benchmark in 1 sample, with a concentration in that sample of 1.16 ug/m3.

1,3-Butadiene, exceeding a benchmark in 1 sample, with a concentration of 0.04 ug/m3 in that sample.

Benzene, exceeding a benchmark in all 6 valid samples, with a concentration range in these six samples of 0.29 to 1.02 ug/m3.

Carbon tetrachloride, exceeding a benchmark in all 6 valid samples, with a concentration range in these six samples of 0.50 to 0.57 ug/m3.

Chloromethane exceeded only a screening level.

Benzene and carbon tetrachloride exceeded both screening levels and cancer benchmarks.

1,3-Butadiene exceeded a cancer benchmark.

Acrolein exceeded both screening levels and a non-cancer benchmark. In addition, acrolein was the only VOC to exceed an ATSDR MRL.

Results for the two duplicate samples collected on January 12 were good. Only 4 of the 18 detected VOCs had a relative percent difference (RPD) greater than 20%, but one of these 4 VOCs was benzene, which exceeded a benchmark. The RPD for benzene in the two duplicate samples was 41.42%.

The benzene/toluene ratios in the six valid samples ranged from 0.75 to 1.79. These ratios are NOT characteristic of vehicular (gasoline engine) emissions.

The concentrations of carbon tetrachloride and chlorofluorocarbons [Dichlorodifluoromethane (freon 12), Dichlorotetrafluoroethane (freon 114), and Trichlorofluoromethane (freon 11)] detected in the six samples were relatively stable. The concentration ranges of each of these VOCs in the six samples were as follows: carbon tetrachloride (0.50 to 0.57 ug/m3); Freon 12 (2.08 to 2.53 ug/m3); Freon 114 (0.07 to 0.14 ug/m3); and Freon 11 (1.07 to 1.41 ug/m3). This is consistent with the fact that such VOCs have stable global background concentrations in the USA.

There were no exceedances of NAAQS standards (24-hour or 8-hour standard, as applicable) for NO2, SO2, PM10, PM2.5, and ozone at the Pryor station on any of the five VOC sample days.

Finally, the wind direction varied considerably from one sample date to the next, being predominantly from the NE, E, SE, S, and/or SW on January 6, 12, and 30, and predominantly from the west on January 18. Winds were light (1 to 6 mph) and variable on January 24, coming from all points of the compass except the north. Wind speeds varied from 1 to 11 mph on the other four sample days. The Cherokee Heights tribal housing complex and the city of Locust Grove lie to the east and southeast of the Pryor monitoring station; U. S. highway 412 lies south of the station; Mid-America Industrial Park lies to the west, southwest, and northwest of the station; and other industry lies to the northeast of the station. There was no rainfall on four of the five valid sample dates, while 1.08 inches of freezing rain fell on January 12. Ambient air temperatures ranged from a low of 20 degrees F on January 30 to a high of 64 degrees F just after midnight on January 12.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS

Analysis of the 23 valid samples collected from September 26, 2006 to January 30, 2007 revealed no obvious seasonal trends in occurrences or concentrations of VOCs (see attached Tables of seasonal trends data). The decline in the average number of VOCs detected in the January samples was an artifact of the higher MDLs achieved by the lab for most January samples (see discussion of MDLs above). Otherwise, particular VOCs did not appear or disappear with the changing seasons, and the concentrations of detected VOCs did not show a tendency to rise or fall with the changing seasons. The concentrations of detected VOCs remained steady, fluctuating within a narrow range of concentrations that showed little or no change with the seasons. The concentrations of some VOCs remained remarkably constant, perhaps because they were present only at concentrations that were very close to the method detection limits that the lab (ERG) could achieve.

Of the eight VOCs that exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more of the 23 valid samples, only acrolein showed a very slight tendency to change in concentration with the seasons. Acrolein was present at its highest concentrations in September and early October, then declined very slightly in concentration after mid-October. Six of the other seven VOCs showed no tendency to rise or fall in concentration with the changing seasons, while the seventh VOC (1,2-dichloroethane) was detected in only one sample (November 25). Meanwhile, the concentrations of carbon tetrachloride leveled off at the low end of their range during the month of January, 2007.

ERG analyzed each of the 6 valid samples collected in January, 2007 for a suite of 60 VOCs (see attached Table of seasonal trends data). 22 VOCs were detected in all 6 valid samples, while 8 other VOCs were detected in 3 to 5 samples. Of the five VOCs that exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more of these 6 valid samples, acrolein, chloromethane, benzene, and carbon tetrachloride were detected in all 6 samples, while 1,3-butadiene was detected in 5 samples.

Conversely, 29 VOCs were undetected in all 6 samples, while the one remaining VOC was detected in only 1 sample.

There are relatively stable global background concentrations of carbon tetrachloride and chlorofluorocarbons (such as freons) in the atmosphere. Therefore, it was no surprise that carbon tetrachloride and the four chlorofluorocarbons included in sample analyses for this project were detected in all 6 valid samples collected in January at concentrations that showed no tendency to vary with the changing seasons.

VOC concentrations in the one sample collected on a Saturday did not appear to differ significantly from VOC concentrations in samples collected on week days. Thus there are few, if any, noticeable changes in VOC concentrations on weekends, when industrial activity at Mid-America Industrial Park and other nearby industries might be expected to decline.

The ice storm that began on January 12 and the subsequent electrical power outages that it caused did not have any noticeable effect on VOC concentrations. Such concentrations did not rise or fall sharply from their normal ranges on the two sample days (January 12 and 18) most affected by the storm.

In summary, four months of VOC data have been collected so far, and, as yet, no seasonal trends have become apparent in the occurrences and concentrations of VOCs.

SEASONAL TRENDS IN DETECTED VOC CONCENTRATIONS AT CHEROKEE HEIGHTS

6 January to 31 March, 2007

Samples were 24-Hour time-weighted average samples collected in 6L canisters and analyzed via EPA Test Method TO-15.

VOC Detected in One or More Valid Samples *	Valid Sample Dates **														
	Sat 1/6	Fri 1/12	Thurs 1/18	Wed 1/24	Tues 1/30	Mon 2/5	**Sun 2/11**	**Sat 2/17**	Fri 2/23	Thurs 3/1	Wed 3/7	Tues 3/13	Mon 3/19	**Sun 3/25**	**Sat 3/31**
Acetylene	1.49	1.09 1.20	0.43	1.29	0.25										
Propylene	0.60	0.71 0.88	0.31	0.29	0.31										
Dichlorodifluoromethane (Freon 12)	2.28	2.33 2.53	2.13	2.08	2.08										
Chloromethane	1.06	1.08 **1.16**	0.81	0.83	0.81										
Dichlorotetrafluoroethane (Freon 114)	0.14	0.07 0.14	0.07	0.07	0.07										
Vinyl Chloride	ND	ND 0.03	ND	ND	ND										
1,3-Butadiene	0.04	0.02 0.04	0.02	**0.04**	ND										
Bromomethane	0.04	0.04 0.04	0.04	0.04	0.04										

* VOCs shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark in one or more samples.

** Sample dates on weekends and holidays are shown in **Bold Face**. Sample concentrations are in micrograms per cubic meter. Sample dates with two concentrations indicate duplicate samples. Sample concentrations shown in **Bold Face** exceeded an EPA, ATSDR, or ODEQ health-based benchmark. ND = VOC not detected in this sample.

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6 January to 31 March, 2007

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Chloroethane	0.03	0.03 0.03	ND	0.03	ND										
Acetonitrile	ND	ND ND	0.10	0.14	0.08										
Acrolein	**1.31**	**0.97** **1.17**	**1.24**	**1.33**	**1.59**										
Trichlorofluoromethane (Freon 11)	1.29	1.29 1.41	1.18	1.24	1.07										
Acrylonitrile	ND	ND ND	ND	ND	ND										
1,1-Dichloroethene	ND	ND ND	ND	ND	ND										
Dichloromethane (Methylene Chloride)	0.21	0.35 0.38	0.21	0.17	0.14										
Carbon Disulfide	0.06	0.13 0.13	ND	ND	ND										

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Trichlorotrifluoroethane	0.61	0.61 0.69	0.69	0.77	0.69										
Trans-1,2-Dichloroethylene	ND	ND ND	ND	ND	ND										
1,1-Dichloroethane	ND	ND ND	ND	ND	ND										
Methyl tert-Butyl Ether	ND	ND ND	ND	ND	ND										
Methyl Ethyl Ketone	2.42	1.80 3.13	2.69	2.28	3.43										
Chloroprene	ND	ND ND	ND	ND	ND										
cis-1,2-Dichloroethylene	ND	ND ND	ND	ND	ND										
Bromochloromethane	ND	ND ND	ND	ND	ND										

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Chloroform	0.05	0.10 0.10	0.10	0.05	ND										
Ethyl tert-Butyl Ether	ND	ND ND	ND	ND	ND										
1,2-Dichloroethane	ND	ND ND	ND	ND	ND										
1,1,1-Trichloroethane	0.05	0.05 0.11	0.05	0.05	0.05										
Benzene	**0.58**	**1.02** **0.67**	**0.42**	**0.45**	**0.29**										
Carbon Tetrachloride	**0.50**	**0.50** **0.57**	**0.50**	**0.50**	**0.50**										
tert-Amyl Methyl Ether	ND	ND ND	ND	ND	ND										
1,2-Dichloropropane	ND	ND ND	ND	ND	ND										

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Ethyl Acrylate	ND	ND ND	ND	ND	ND										
Bromodichloromethane	ND	ND ND	ND	ND	ND										
Trichloroethylene (TCE)	0.05	0.05 0.05	ND	ND	0.11										
Methyl Methacrylate	ND	ND ND	ND	ND	ND										
cis-1,3-Dichloropropene	ND	ND ND	ND	ND	ND										
Methyl Isobutyl Ketone	0.41	0.33 0.53	0.21	0.21	0.25										
trans-1,3-Dichloropropene	ND	ND ND	ND	ND	ND										
1,1,2-Trichloroethane	ND	ND ND	ND	ND	ND										

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Toluene	0.57	0.57 0.57	0.49	0.60	0.34										
Dibromochloromethane	ND	ND ND	ND	ND	ND										
1,2-Dibromoethane	ND	ND ND	ND	ND	ND										
n-Octane	0.14	0.14 0.14	0.09	0.09	0.05										
Tetrachloroethylene	0.07	0.07 0.07	0.07	0.07	0.07										
Chlorobenzene	ND	ND ND	ND	ND	ND										
Ethylbenzene	0.13	0.13 0.13	0.09	0.09	0.09										
m,p-Xylene	0.26	0.26 0.26	0.17	0.17	0.13										

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Bromoform	ND	ND ND	ND	ND	ND										
Styrene	0.09	0.09 0.09	0.04	0.13	ND										
1,1,2,2-Tetrachloroethane	ND	ND ND	ND	ND	ND										
o-Xylene	0.13	0.13 0.13	0.09	0.09	0.09										
1,3,5-Trimethylbenzene	0.05	0.05 0.05	ND	0.05	ND										
1,2,4-Trimethylbenzene	0.15	0.15 0.10	0.05	0.05	0.10										
m-Dichlorobenzene	ND	ND ND	ND	ND	ND										
Chloromethylbenzene	ND	ND ND	ND	ND	ND										

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p-Dichlorobenzene	ND	ND ND	ND	ND	ND										
o-Dichlorobenzene	ND	ND ND	ND	ND	ND										
1,2,4-Trichlorobenzene	ND	ND ND	ND	ND	ND										
Hexachloro-1,3-Butadiene	ND	ND ND	ND	ND	ND										

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Kent Curtis
<Kent-Curtis@cherokee.org>
03/30/2007 09:55 AM

To Aunjanee Gautreaux/R6/USEPA/US@EPA
cc Ryan Callison <Ryan-Callison@cherokee.org>
bcc

Subject quarterly report for Cherokee air toxics

Aunjanee,
I will send you the quarterly technical report for our Cherokee Nation Community Air Toxics Project during the week of April 2nd.
Kent Curtis